Amendments to the Specification

Please amend the paragraph beginning at page 3, line 19 as indicated:

Figure 14 is a partial cross-sectional side view of one example embodiment of a gas removal device including structure for connection to a fluid delivery system and structure for allowing insertion of a device into and through the gas removal device, similar to that ~~in~~ shown in Figure 13, but wherein the gas removal device includes a central venting configuration and the device lumen extends through a side wall of the device housing;

Please amend the paragraph beginning at page 4, line 19 as indicated:

Figure 23 is a ~~is a~~ partial cross-sectional view of the gas removal devices of Figure 22 taken along line 23-23 of Figure 22;

Please amend the paragraph beginning at page 6, line 19 as indicated:

One example embodiment of a liquid delivery system is shown in Figure 1. Figure 1 is a side view of an example infusion system 10 including one or more, and in this case, a plurality of gas removal devices 12a-c. In this particular embodiment, the infusion system is a catheter infusion system including a catheter 25, a manifold 14, and one or more liquid supply containers or reservoirs 16 and 18. The system 10 may also include one or more infusion and/or aspiration devices 20, for example, a syringe, a bulb, a pump, or other such device. Additionally, the system 10 may include one or more monitoring and/or sensing devices 30, for example a pressure sensing device, temperature sensing device, or other like monitoring and/or sensing devices. The infusion system 10 provides for one or more selective fluid pathways for the selective delivery of one or more liquids from the liquid supply containers 16 and 18 to the catheter 25. The catheter 25 can be adapted and/or configured to deliver the fluid internally to the patient. As can be appreciated, the gas removal devices 12a-c can be put into fluid communication with one or more of the fluid pathways within the system 10 to remove gas from one or more of the liquids being delivered to the patient. It should be understood that a broad variety of suitable catheters, [[a]] manifolds, liquid supply containers or reservoirs, infusion devices, monitoring and/or sensing devices and the like are generally known in the art, and may

be used in such an infusion system and/or in conjunction with gas removal devices. It should also be understood that the gas removal devices and configurations disclosed herein may be used with any of a broad variety of alternative fluid delivery structures and/or systems, and are not limited for use with this type of infusion system 10 or with the particular components shown.

Please amend the paragraph beginning at page 7, line 24 as indicated:

The manifold 14 may also include one or more infusion device ports 26, which can be adapted and/or configured to engage and provide fluid communication between an infusion device ~~devices~~ 20, for example, a syringe or the like, and the main fluid delivery lumen 17. Additionally, the manifold 14 may include one or more monitoring and/or sensing devices ports 27, which can be adapted and/or configured to engage and provide fluid communication between a monitoring and/or sensing device 30, for example a pressure sensing device, and the main fluid delivery lumen 17. The ports 26/27 may also optionally include valves, such as stopcock type valves or the like, that can be individually manipulated to selectively provide fluid communication between the ports 26/27 and the main fluid delivery lumen 17. For example, in this embodiment, a valve 32a is shown on port 27 to provide for selective fluid communication between the pressure sensing devices 30 and the main fluid delivery lumen 17. Such a valve could also be included on port 26 to provide for selective fluid communication between the infusion devices 20 and the main fluid delivery lumen 17.

Please amend the paragraph beginning at page 9, line 26 as indicated:

As can be appreciated, during such liquid delivery procedures, the liquid being delivered from the liquid supply containers 16/18 to the catheter 25, and ultimately to the patient, passes through at least one of the gas removal devices 12a-c for degassing. For example, liquid delivered from the fluid container 16 will pass through gas removal devices 12a and 12c. Similarly, delivered from the fluid container 18 will pass through gas removal devices 12b and 12c. It should be understood that this infusion system 10 is given by way of example only, and that in many applications, each liquid being delivered to a patient may pass through more or fewer than two gas removal devices. For example, in the system shown, gas removal devices 12a and 12b could be removed from the system, and all fluid being delivered to the catheter 25

would still pass through gas removal device ~~devices~~ 12c for degassing. As another example, in the system shown, gas removal device 12c could be removed, and all liquid being delivered to the catheter 25 would still pass through either gas removal device 12a or 12b for degassing. It can also be appreciated that in some applications, only some of the liquid may need to be degassed ~~degasses~~, and therefore, a system may be set up such that some liquids being delivered may not pass through a gas removal device. However, as can be appreciated, during [[a]] liquid delivery procedures, at least some of the liquid being delivered may pass through one or more gas removal devices, for example devices 12a-c, for degassing.

Please amend the paragraph beginning at page 12, line 19 as indicated:

Referring to Figures 3 and 4, one or more opening 41 is defined in the wall of the tubular member 38 to expose the lumen 40 therein and being adapted to provide for fluid communication between the gas collection space 56 and the lumen 40. In the embodiment shown, fluid communication between the gas collection space 56 and the lumen 40 through the opening 41 is provided by attaching the gas permeable membrane layers 52/54 to the tubular member 38 in such a manner as to allow for such fluid communication. For example, the first layer 52 may be attached to the tubular member 38 along a first side of the opening 41, for example at attachment point 39, and the second layer 54 may be attached to the tubular member 38 along a second side of the opening 41, for example at attachment point 43. This arrangement thereby provides for fluid communication between the gas collection space 56 and the lumen 40, and ultimately, provides for ~~provides~~ fluid communication between the gas collection space 56 and the gas outlet 34.

Please amend the paragraph beginning at page 15, line 1 as indicated:

Likewise, in some embodiments, the size of the gas collection space 56 can be configured to provide for an acceptable flow rate of the gas through the gas flow space 56, while maintaining an ~~and~~ efficient use of space. Depending upon the particular layers used, and upon the desired performance of the device, those of skill in the art will be able to determine appropriate sizing for the gas collection space 56. In the embodiment shown, the spacer layer 58 may at least partially aid in defining the size of the gas collection space 56. In some example

embodiments, the gas collection space 56 can have a thickness (gap) in the range of about 20 or more microns, or in the range of about 40 to about 1000 microns. In some embodiments, the length of the gas collection space 56 is at least partially defined by the width of the membrane layers 52/54, or in other words the distance of the filter material along the longitudinal axis of the device. In some embodiments, the gas collection space 56 may have a length in the range of about 0.1 inches, or more, or in the range of about 0.2 to about 20 inches or more, or in the range of about 0.5 to about 15 inches or more. In some embodiments, the width of the gas collection space 56 is at least partially defined by the length of the membrane layers 52/54, or in other words the distance of the membrane material, for example, measured as it spirals about the longitudinal axis of the device. In some embodiments, the gas collection space 56 may have a width in the range of about 0.5 inches, or more, or in the range of about 0.5 to about 50 inches or more, or in the range of about 0.5 to about 30 inches or more.

Please amend the paragraph beginning at page 17, line 25 as indicated:

Refer now to Figures 6-8 for discussion of another example embodiment of a gas removal device 212 that is somewhat similar to the device 112 shown above, wherein like reference numbers indicate similar structure. The device 212 includes a gas filter structure 250 disposed within the chamber 48 of the housing 42. The gas filter structure 250, similar to structure 50 discussed above, includes a plurality of gas permeable membrane layers in a coiled and/or spiral configuration within the chamber 48. For example, the filter structure 250 includes a first gas permeable membrane layer 252 and a second gas permeable membrane layer 254 defining a gas collection space 256 disposed between the two layers 252/254. The layers 252/254 each include an inner surface 251 and an outer surface 253, and the inner surfaces 251 at least partially define the bounds of the gas collection space 256, and the outer surfaces 253 at least partially define a contact area, and/or liquid flow space 257 for liquid passing within the device 212. When the filter structure 250 is placed into a housing 42, the outer surfaces 253, potentially in combination with the inner surface of the housing 42, will help define the liquid flow space 257. The outer surfaces <u>253</u> ~~523~~ (i.e., liquid contact area and/or liquid flow space 257) are separated from the gas collection space 256 by at least one of the membrane layers 252/254. Therefore, as liquid passes through the liquid flow space and over the outer surfaces 253 of the gas permeable

membrane layers 252/254, gas (if any) within the liquid can permeate one of the gas permeable membrane layers 252/254 and enter into the gas collection space 256. Additionally, the filter structure 250 can also include one or more spacer layers 258 (i.e. permeate spacer layer) as seen in Figure 8 disposed within the gas collection space 256, and one or more spacer layers 260 (i.e., flow spacer layer) as seen in Figure 8 disposed within the liquid flow space 257, for example, along the outer surfaces 253 of one or both of the membrane layers 252/254.

Please amend the paragraph beginning at page 18, line 19 as indicated:

So, as can be seen, in many regards, the gas filter structure 250 can include substantially the same structure, form and materials as discussed above regarding filter structure 50. However, in this embodiment, the gas collection space 256 is placed in fluid communication with a gas outlet 234 using a different construction. In this embodiment, the gas outlet 234 defines one or more openings 241 in the wall of the housing 42. In the embodiment shown, fluid communication between the gas collection space 256 ~~56~~ and the gas outlet 234 is provided through the opening 241 by attaching the gas permeable membrane layers 252/254 to the housing 42 in such a manner as to allow for such fluid communication. For example, the first layer 252 may be attached to the housing 42 along a first side of the opening 241, for example at attachment point 239, and the second layer 254 may be attached to the housing 42 along a second side of the opening 241, for example at attachment point 243. This arrangement thereby provides for fluid communication between the gas collection space 256 ~~56~~ and the gas outlet 234 ~~34~~.

Please amend the paragraph beginning at page 22, line 1 as indicated:

However, in this embodiment, the device 512 includes a separate medical device port 568 and fluid inlet port 544, as discussed above. Therefore, the proximal end 580 of the tubular member 570 is not coaxially disposed within the fluid inlet port 544, but rather, the fluid inlet port 544 is spaced from the tool inlet port 568. In this embodiment, the tool inlet port 568 is disposed generally along the longitudinal axis of the device 512, while the fluid inlet port 544 is oriented at an ~~and~~ angle with the longitudinal axis of the device 512. Additionally, one or more

sealing structures 574 can be disposed within the lumen 572 of the conduit 570, such as the sealing structures described above with reference to Figure 10.

Please amend the paragraph beginning at page 22, line 10 as indicated:

Figure 14 shows another alternative embodiment of a gas removal device 612 that may be used, for example, in place of the gas removal device 512 of a liquid delivery system 510 shown in Figure 12. The device 612 is substantially similar to the embodiment shown in Figure ~~Figures~~ 11, and as discussed above, wherein like reference numerals indicate similar structure. For example, the filter structure 50 and arrangement is substantially similar to the embodiment shown in Figure 11 (which is substantially the same filter structure 50 of Figures 2-5). Additionally, the device 612 also includes a medical device conduit 670 including a lumen 672 extending through at least a portion of the chamber 48 within the housing 42, which is substantially similar in form and function to the conduit 470 including lumen 472 of Figure 11. For example, the conduit 670 can be a tubular member configured to receive an elongated medical device. In the embodiment shown, the gas conduit 38 and the medical device conduit 670 can be coaxially disposed along at least a portion of the lengths thereof, however, this is not required.

Please amend the paragraph beginning at page 22, line 24 as indicated:

However, in this embodiment, the device 612 includes a separate medical device port 668 and fluid inlet port 644, for example, as discussed above with reference to Figures 12 and 13. Therefore, the proximal end 680 of the tubular member 670 is not coaxially disposed within the fluid inlet port 644, but rather, the fluid inlet port 644 is spaced from the tool inlet port 668. In this embodiment, the ~~668~~ fluid inlet port 644 ~~544~~ is disposed generally along the longitudinal axis of the device 612 ~~512~~, while the tool inlet port 668 is oriented at and angle with the longitudinal axis of the device 612 ~~512~~. Additionally, one or more sealing structures 674 can be disposed within the lumen 672 of the conduit 670, such as the sealing structures described above with reference to Figure 10.

Please amend the paragraph beginning at page 23, line 3 as indicated:

Figures 15 and 16 disclose another alternative embodiment of a gas removal device 712. In some regards, the device 712 is substantially similar to the structure of the device shown in Figures 6-8, wherein similar reference numbers indicate similar structure. For example, the filter structure 250 and arrangement is substantially similar to the embodiment shown in Figures ~~Figure~~ 6-8.

Please amend the paragraph beginning at page 23, line 22 as indicated:

In the embodiment shown, the valve assembly 713 includes a first one way check valve 768 disposed within the first liquid path conduit 749 configured to allow one-directional liquid flow from the liquid inlet 744 to the liquid outlet 746 through the first liquid path conduit 749. The valve assembly 713 also includes an ~~and~~ a second one way check valve 770 disposed within the second liquid path conduit 762 configured to allow one-directional liquid flow from the liquid outlet 746 to the liquid inlet 744 through the second liquid path conduit 762. Fig 15 shows fluid flow through the first liquid path – through the filter structure 250. Figure 16 shows fluid flow through the second liquid path 762 ~~760~~ – away from, and not through the filter structure 250. It should be understood that such valve assembly and structure could be arranged at alternative locations along the liquid path conduits 749/762, and/or could include different types of valves and/or fluid path assemblies. For example, the valve assemblies may be disposed adjacent the liquid outlet 746, or at other locations along the conduits 749/762.

Please amend the paragraph beginning at page 24, line 19 as indicated:

However, in this embodiment, the device 812 further includes a conduit 870 ~~872~~ extending through at least a portion of the chamber 748 within the housing 742, the conduit 870 ~~872~~ extending from adjacent the liquid inlet 744 to adjacent the liquid outlet 746, and being configured to receive, for example, an elongated medical device. For example, the conduit 870 ~~872~~ may be similar in structure and configuration to the conduit 370 described above with reference to Figure 10. Additionally, one or more sealing structures 874 can be disposed within

the lumen 872 of the conduit 870, such as the sealing structures described above with reference to Figure 10.

Please amend the paragraph beginning at page 24, line 27 as indicated:

Figures 18-20 are useful in describing another example embodiment of a gas removal device 912. Refer now to Figure 20, which is a partial cross-sectional view taken along a vertical line perpendicular to a longitudinal axis of the gas removal device ~~devices~~ 912 (for example, a view similar to cross sectional view of the device 112 shown in Figure 3). Similar to the devices described above, the device 912 includes a housing 942 defining a chamber 948 disposed at least partially between a liquid inlet and a liquid outlet. Although not shown in this view of the device 912, the inlet and outlet are substantially similar to those shown in the other embodiments disclosed herein. A gas filter structure 950 is disposed within the chamber 948.

Please amend the paragraph beginning at page 25, line 6 as indicated:

With reference to Figures 18 and 19, the filter structure 950 is also substantially similar to the other embodiments described herein in that it includes a first gas permeable membrane layer 952 spaced from a second gas permeable membrane layer 954 to form a gas collection space 956 disposed between the two layers 952/954. The layers 952/954 each include an inner surface 951 and an outer surface 953, and the inner surfaces 951 at least partially define the bounds of the gas collection space 956, and the outer surfaces 953 at least partially define a contact area and/or liquid flow space 957 for liquid passing within the device 912. The filter structure 950 can also include one or more spacer layers 958 (i.e., permeate spacer layer) disposed within the gas collection space 956, for example, to aid in maintaining the gas collection space 956 ~~56~~ open. Additionally, the filter structure 950 can also include one or more spacer layers 960 (i.e., flow spacer layer) disposed within the liquid flow space 957, for example along the outer surfaces 953 of one or both of the membrane layers 952/954. The spacer layer 960 can aid in maintaining the liquid flow space 957 open by keeping the outer surfaces 953 of the two membrane layers 952/954 separate from each other and/or appropriately spaced from other structures.

Please amend the paragraph beginning at page 27, line 3 as indicated:

However, this embodiment includes a gas outlet 1034 that includes a negative pressure and/or vacuum creating structure 1080 directly attached thereto. The vacuum creating structure 1080 can be adapted to apply vacuum pressure to the gas outlet 1034 which is in fluid communication with the gas collection space 256. As discussed above, such vacuum may facilitate removal of dissolved gasses from the liquid according to Henry's Law. Any of a broad variety of vacuum creating structures generally known ~~know~~ in the art may be used, for example, a pump, syringe, bulb, or the like. In this embodiment, the vacuum creating structure 1080 is directly connected to the gas outlet 1034, and in at least some embodiments, is of unitary construction with the gas outlet 1034 and/or the housing 42 of the device 1012. For example, in the device 1012 shown, the vacuum creating structure 1080 is a syringe like structure mounted onto, and in some respects, of unitary construction with the housing 42. The structure 1080 includes a lumen 1082 defined by a portion 1031 of the housing 42 and an outer wall structure 1030. A plunger member 1084 is disposed within the lumen 1082 ~~1882~~. The plunger member 1084 can ~~1084ean~~ be manipulated to apply a vacuum pressure on the gas outlet 1034, and therefore to the gas collection space 256.

Please amend the paragraph beginning at page 27, line 19 as indicated:

Reference is now made to Figures 22-23A, which illustrate another example embodiment of a gas removal device 1112. Similar to the devices discussed above, the device 1112 includes a housing 42 defining a liquid inlet 44, a liquid outlet 46, and a chamber 48 disposed at least partially between the inlet 44 and outlet 46. However, in this embodiment, the device 1112 ~~112~~ includes a different gas filter structure 1150 disposed within the chamber 48.

Please amend the paragraph beginning at page 27, line 25 as indicated:

In the embodiment shown, the filter structure 1150 includes a plurality of hollow tubular members and/or fibers 1152 made of a gas permeable membrane material. The fibers can be made of the same type of membrane material as discussed in the embodiments above, but would

be hollow fiber members 1152 each including a lumen 1154 which defines a plurality of liquid flow spaces 1156 ~~1154~~. The plurality of fiber members 1152 each includes a first end 1161 and a second end 1163. The fiber members 1152 are held in place at their first ends 1161 and their second ends 1163 within the chamber 48 by first and second liquid tight seals 1190/1191 that are disposed between the ends 1161/1163 of each of the fiber members 1152 and the interior surface of the lumen defined by the cavity 48. The first and second seals 1190/1191 can include, for example, a potting resin that fills the voids between the fiber members 1152, and bonds to the interior surface of the cavity 48 to form a fluid tight seal once hardened or cured. The potting resin can comprise, for example, a multicomponent (resin and hardener component) thermosetting or UV-curable resin, such as for example, silicone, urethane or epoxy, all of which will provide secure attachment of the fiber members 1152 within the cavity 48, as well as insuring a fluid tight seal around the fiber members 1152 and against the interior surface of the cavity 48. In at least some embodiments, the material would be FDA grade.

Please amend the paragraph beginning at page 28, line 13 as indicated:

As seen best in the cross-sectional view of Figure 23, the fluid tight seals 1190/1191 (seal 1190 is depicted in Figure 23 [[3]]) are closely formed around the external surfaces of the fiber members 1152 and, if present, the conduit 1138, which is more fully described below. As seen best in the cross-sectional view of Figure 23A, the fiber members 1152 and, if present, the conduit 1138 extend freely between the first and second fluid tight seals 1190/1191. Alternatively, intermediate supports and/or baffles can be provided between the first and second fluid tight seals 1190/1191. The first and second fluid tight seals 1190/1191, along with the interior surface of the chamber 48, define a sealed gas collection space 1156 within the housing 42. The gas collection space 1156 is in fluid communication with the gas outlet 1134. In the embodiment shown, fluid communication between the gas collection space 1156 the gas outlet 1134 is provided by a conduit 1138 extending within the housing, the conduit 1138 connecting and in fluid communication with the gas collection space 1156 the gas outlet 1134. In the embodiment shown, the conduit 1138 is a hollow tubular member having a wall defining a lumen 1140 therein that provides fluid communication between the gas collection space 1156 and the gas outlet 1134. One or more opening 1141 is defined in the wall of the tubular member 1138 to

expose the lumen 1140 therein for fluid communication between the gas collection space 1156 and the lumen 1140. As discussed above in other embodiments, the removal of dissolved gasses present in the liquid can be additionally facilitated by use of negative pressure and/or vacuum applied to the gas collection space 1156, for example, through the gas outlet 1134.

Please amend the paragraph beginning at page 29, line 4 as indicated:

Figure 24 shows another alternative embodiment of a gas removal device 1212, similar to that shown in Figures 22-23, wherein like reference numbers indicate similar structure. For example, the filter structure 1150 ~~1250~~ is substantially similar to the embodiment shown in Figures 22-23. However, in this embodiment, the device 1212 also includes a conduit 1170 ~~1270~~ extending through at least a portion of the chamber ~~1248~~ within the housing 42, for example, as described above with reference to the devices 312/412 shown in Figures 10 and 11. The conduit 1170 ~~1270~~ extends from adjacent the liquid inlet 44 to adjacent the liquid outlet 46, and is configured to receive an elongated medical device. In the embodiment shown, the conduit 1170 ~~1270~~ is a tubular member defining a lumen 1242 configured for receiving and/or passing an elongated medical device there through. In the embodiment shown, the gas conduit 1138 and the medical device conduit 1170 ~~1270~~ can be coaxially disposed along at least a portion of the lengths thereof, however, this is not required.

Please amend the paragraph beginning at page 29, line 17 as indicated:

Figure 25 shows another alternative embodiment of a gas removal device 1312, similar to that shown in Figures 22-23, wherein like reference numbers indicate similar structure, but including a different venting structure. Rather than including a conduit 1138 to provide fluid communication with the gas outlet 1134, as described ~~describe~~ in the embodiments of Figures 22-24, this embodiment provides direct fluid communication between the gas collection space 1156 and the gas outlet 1334. The gas outlet 1334 is disposed in the housing 42 in fluid communication with the gas collection space 1156. This embodiment also includes a structure that may allow for the reverse flow of liquid through the device 1312 such that the liquid flowing in the reverse direction does not flow through the filter structure 1150, for example, similar to the

devices described above with reference to Figures 15-17, wherein like reference numbers indicate similar structure.

Please amend the paragraph beginning at page 29, line 29 as indicated:

Figure 26 shows another alternative embodiment of a gas removal device 1412, similar to that shown in Figure ~~Figures~~ 25, wherein like reference numbers indicate similar structure. In this embodiment, however, the device 1412 includes a gas outlet 1034 that includes a negative pressure and/or vacuum creating structure 1080, for example, as described above in the embodiment shown in Figure 21, wherein like reference numbers indicate similar structure.